

Attorney Docket No.: 01CON334P
Application Serial No.: 09/782,791

REMARKS

This is in response to the final Office Action, dated December 8, 2004, where the Examiner has rejected claims 1-70 in view of a new cited reference. Reconsideration and allowance of outstanding claims 1-70 in view of the following remarks are requested.

A. Rejections of Claims 1-5, 12-20, 27-34, 42-49, 54-58 and 63-66 under § 103(a)

The Examiner has rejected claims 1-5, 12-20, 27-34, 42-49, 54-58 and 63-66 under 35 USC §103(a) as being unpatentable over U.S. Patent Number 6,453,289 to Ertem, et al. ("Ertem") in view of U.S. Patent Number 5,012,519 to Adlersberg, et al. ("Adlersberg"). For the reasons discussed below, applicant respectfully submits that the present invention, as defined by independent claims 1, 16, 30, 45, 55 and 63, is patentably distinguishable over Ertem in view of Adlersberg.

Embodiments according to the present invention relate to digital speech coding systems having noise suppression capabilities. Conventional frequency-domain noise suppression techniques reduce some background noise in speech frames. However, the conventional frequency-domain techniques introduce significant speech distortion if the background noise is excessively suppressed. The frequency-domain noise suppression techniques may produce a relatively unnatural sound overall, especially when the background noise is excessively suppressed.

Embodiments according to the present invention relate to a noise suppression system and method that accurately reduces the background noise in a speech coding system. Advantageously, the present system utilizes a gain factor G_f to suppress the background noise in

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the time domain while maintaining the speech signal. For example, independent claim 1 recites "adjusting at least one gain as a function of noise characteristic for attenuating background noise in at least one frame, wherein the at least one gain is adjusted according to a gain factor, the gain factor facilitating time-domain background noise attenuation".

In contrast, Ertem utilizes a voice activity detector (VAD) that employs line spectral frequencies and enhanced input speech which has undergone noise reduction to generate a voice activity flag. A gain function is smoothed both across frequency and time in an adaptive manner based on an estimate of the signal-to-noise (SNR) ratio. As stated in Ertem and shown in FIG. 7 of Ertem, the input speech signals goes through the FFT process (see block 90), and then in block 98 and in the frequency domain, "gain functions are computed ... using the smoothed noise spectral estimate and the input signal spectrum" (Col. 11, lines 58-61.) Thereafter, in block 104, an inverse FFT is applied to the frequency domain sequence to obtain the time domain signal. (Col. 12, lines 9-13.)

Therefore, Ertem does not disclose, teach, or even suggest that the gain factor is adjusted in the time domain; rather, Ertem discloses that gain functions are computed using the smoothed noise spectral estimate and the input signal spectrum in the frequency domain. In contrast, claim 1 recites "wherein the at least one gain is adjusted according to a gain factor, the gain factor facilitating time-domain background noise attenuation."

Furthermore, the new cited referenced Adlersberg suffers from a similar shortcoming. For example, FIG. 4 of Adlersberg clearly shows that the functions of subblocks 19, 52, 53, 58, 55, 56 and 59 are performed in the frequency domain after applying FFT 40 to the speech signal, and before applying IFFT 70 to convert the frequency domain signal to the time domain signal.

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Therefore, Adlersberg teaches that any gain adjustment is performed in the frequency domain and not the time domain. In contrast, as stated above, claim 1 recites "wherein the at least one gain is adjusted according to a gain factor, the gain factor facilitating time-domain background noise attenuation."

For the foregoing reasons, applicant respectfully submits that the present invention as defined by independent claims 1, 16, 30, 45, 55 and 63 is not taught, disclosed, or suggested by Ertem and Adlersberg. Thus, independent claims 1, 16, 30, 45, 55 and 63 are patentably distinguishable over Ertem and Adlersberg. As such, the claims depending from independent claims 1, 16, 30, 45, 55 and 63 are, *a fortiori*, also patentably distinguishable over Ertem in view of Adlersberg for at least the reasons presented above and also for additional limitations contained in each dependent claim.

B. Rejections of Claims 6-11, 21-26, 35-41, 50-53, 59-62, and 67-70 under 35 USC §103(a)

The Examiner has rejected claims 6-11, 21-26, 35-41, 50-53, 59-62, and 67-70 under 35 USC §103(a) as being unpatentable over the combination of Ertem in view of Adlersberg in further view of U.S. Patent Number 6,161,090 to Chandran, et al. ("Chandran"). Applicant respectfully submits that claims 6-11, 21-26, 35-41, 50-53, 59-62, and 67-70 depend from independent claims 1, 16, 30, 45, 55, and 63, respectively, and thus, claims 6-11, 21-26, 35-41, 50-53, 59-62, and 67-70 should be allowed at least for the same reasons discussed above in conjunction with patentability of independent claims 1, 16, 30, 45, 55, and 63.

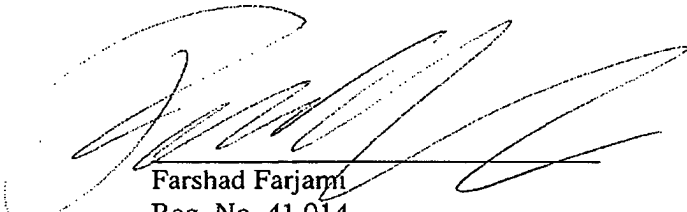
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C. Conclusion

Based on the foregoing reasons, the present invention, as defined by independent claims 1, 16, 30, 45, 55, and 63, and claims depending therefrom, is patentably distinguishable over the art cited by the Examiner. Thus, claims 1-70 pending in the present application are patentably distinguishable over the art cited by the Examiner. As such, and for all the foregoing reasons, an early Notice of Allowance directed to all claims 1-70 pending in the present application is respectfully requested.

Respectfully Submitted,
FARJAMI & FARJAMI LLP

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Farshad Farjami
Reg. No. 41,014

FARJAMI & FARJAMI LLP
26522 La Alameda Ave., Suite 360
Mission Viejo, California 92691
Telephone: (949) 282-1000
Facsimile: (949) 282-1002

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